EVALUATING METHODS FOR ESTIMATING THE HURST EXPONENT IN TIME SERIES A COMPARATIVE ANALYSIS OF ACCURACY AND APPLICATION

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The Hurst exponent (H) is a statistical measure used to understand the long-term memory of time series, characterized by persistence and anti-persistence phenomena. Accurate estimation of H is crucial in diverse fields, such as finance, geophysics, and telecommunications, due to its ability to indicate the future tendency of a system based on its historical behavior. Numerous methods have been developed for estimating H, each with varying degrees of complexity and accuracy. This research reviews these methods, focusing on popular ones like box-counting, Katz, detrended fluctuation analysis, mean squared displacement (MSD), and Higuchi. To evaluate the reliability of these methods, fractional Brownian motion was used as a benchmark due to its well-defined Hurst parameter. Our analysis revealed that the Higuchi method and MSD provided the most accurate estimations of H. Additionally, these methods were applied to other long-memory processes to further validate their effectiveness. This work contributes to the field by identifying the most reliable numerical methods for estimating the Hurst exponent, providing a foundation for future studies and practical applications in analyzing time series with long-range dependencies.